REMARKS

Entry of the foregoing and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

Claims 1-6 were pending in this application. Claims 7-12 have been added. Therefore, claims 1-12 remain pending in the application.

Support for the foregoing amendments can be found, for example, in at least the following locations in the original disclosure: the original claims and the specification, page 7, line 10-12 and page 8, line 20-page 9, line 13.

Entry of the forgoing is appropriate pursuant to 37 C.F.R. §1.116 for at least the following reasons. The amendments raise no new issues that would necessitate further search and/or substantive reexamination and clearly overcome the grounds of rejection.

CLAIM REJECTIONS UNDER 35 U.S.C. §103(a)

Claims 1 to 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,682,590 to Weinl et al. (hereafter "*Weinl '590*") in on the grounds set forth on page 3 of the Office Action. This rejection is respectfully traversed.

The rejection in the Official Action notes that *Weinl '590* is silent with respect to C/(C+N) ratio and the amount of undissolved Ti(C,N) cores, as these features are recited in the present claims. The rejection then continues and asserts that (1) "the alloy taught by the reference has a composition that is encompassed by the instant claims" and (2) "is made by a process which is similar to applicants' process of making the instantly claimed alloy." Further, the Official Action then concludes that "the alloy taught by the reference would be expected to posses all the same properties as recited in the instant claims, including the C/(C+N) ratio and

the amount of undissolved Ti(C,N) cores recited in the applicants' claims." Applicants respectfully disagree with the rejection on these points.

First and as background, in the formation of the claimed alloy, it is well known that the dark cores are remains of the added Ti(C,N) raw material. Supporting this proposition, please see, for example, P. Lindahl et al., Microstructure and Mechanical Properties of a (Ti, W, Ta, Mo)(C,N)-(Co, Ni)-Type Cermet, *J. Hard Mater.*, 4, pp. 187-204 (1993) at Abstract, lines 6-7, and page 200, last paragraph and J. Zackrisson et al., Effect of Carbon Content on the Microstructure and Mechanical Properties of (Ti, W, Ta, Mo)(C, N)-(Co, Ni) Cermets, *International Journal of Refractory Metals and Hard Materials*, vol. 17, 4, pp. 265-273 (August 1999) at page 270, first paragraph of section 4.1 (note page 270 is of publication is page 6 of the paper). Thus, Ti(C,N) powder is required in order to obtain undissolved Ti(C,N) cores in the final product.

Constituents such as (Ti,Ta)(C,N), (Ti,Ta)C and TiN cannot during the sintering process be converted to Ti(C,N). This is because the solubility of N and Ti is very low in the Co-Ni binder, only 0.00145 and 0.046 wt% respectively at, for example, 1430° C. Even if diffusion is rapid in the liquid, the solution precipitation is limited by the low solubilities. Therefore, the only way to form a Ti(C,N) at high temperature is if it is thermodynamically possible, i.e., if there exists a miscibility gap in the cubic carbide phase at this temperature and that one of the products then has exactly the Ti(C,N) composition.

In view of the above, it is respectfully asserted that the compositions disclosed in *Weinl '590* are quite difference from that claimed in that, at least as one example, undissolved cores of Ti(C,N) cannot form when only raw materials such as those in *Weinl '590* are used and Ti(C,N) powder is not originally present in the raw materials in the necessary amounts.

For example, claim 1 and new claim 7 both recite an amount of undissolved Ti(C,N) cores is between 26 and 37 vol%. To obtain such an amount of undissolved Ti(C,N) cores, the present application notes that one needs 50-70 wt% Ti(C,N) in the starting materials (page 8, line 14).

While *Weinl '590* is silent as to the amount of undissolved Ti(C,N) cores, it does disclose the amount of starting raw material Ti(C,N) that is used in forming the disclosed alloy. Here, *Weinl '590* discloses 20 wt% Ti(C,N) (see, col. 4, line 8). Since the remaining Ti-raw materials disclosed in *Weinl '590* (see, col. 4, lines 8-9) cannot contribute to forming undissolved Ti(C,N) cores, it is clear that *Weinl '590* discloses less than half the necessary Ti(C,N) raw materials needed to form the claimed amount of undissolved Ti(C,N) cores.

For at least this reason, the present claims patentably distinguish over the cited reference of *Weinl '590.*

Furthermore, the rejection at least in part asserts that the features of the present claims to which *Weinl '590* is silent are inherently disclosed in *Weinl '590.* However, this can be shown to be inaccurate.

It can be shown that Alloy B of the present application, Example 2, is according to *Weinl '590.* In Example 2 (comparative) of the present application, we have (in at-%) Ti 34.2, W 4.1, Ta 2.5, Mo 2.0, Nb 0.8, Co 8.2, Ni 4.2 and C/(C+N) 0.63. Translating this comparative composition into the form of the formula in *Weinl '590* col. 2, lines 17-18, of $(Ti_a,Ta_b,Nb_c,V_d)_x(Mo_e,W_f)_y(C_g,N_h)_z$, one obtains the following subscripts

a=0.91
b=0.07
c=0.02
d=0
f=0.67

x=0.86
h=0.37

These subscripts are within the disclosed range(s) of *Weinl '590*. Thus, Example 2 can be referred to as representing an alloy within the disclosure of *Weinl '590*. However, in Example 2 of the present application it is also disclosed that the amount of undissolved Ti(C,N) cores is 20.3 vol-% of the hard constituents, i.e. well below the claimed range of the present application.

Thus, to the extent that the Examiner maintains that the disclosure in *Weinl '590*, which has no explicit disclosure of C/(C+N) ratio or amount of undissolved Ti(C,N) cores, does inherently disclose such features, Applicants note that such an assertion of inherency is improper because not every disclosure in *Weinl '590* necessarily results in the claimed amount of undissolved Ti(C,N) cores.

For at least this further reason, the rejection should be withdrawn.

Finally, it can be shown by thermodynamic calculations and simulations[1] that the alloy disclosed in *Weinl '590*, for example as disclosed in Example 1, cannot form the claimed amount of hard constituents with undissolved Ti(C,N) cores.

The solubility of N and Ti is very low in a Co-Ni binder, only 0.00145 and 0.046 wt% respectively at 1430° C. Even if diffusion is rapid in the liquid, the solution precipitation is limited by the low solubilities. The only way to form a Ti(C,N) at high temperature is if it is thermodynamically possible, i.e., if there exists a miscibility gap in the cubic carbide phase at this temperature and that one of the products then has exactly the Ti(C,N) composition. However, combining thermodynamic data[2] and performing an equilibrium calculation at 1430° C

[1] Simulations were conducting using the Thermocalc software available from Thermocalc Software AB (www.thermocalc.com) using database CCC1 and SSOL2.
[2] http://www.thermocalc.se/Products/Database/CCC1; and K. Frisk, S. Norgren, J. Zackrisson, A. Markström and B. Jansson, *Phase equilibria in cemented carbides base on C-Co-W with Ta, Ti, Nb and V additions using*

shows that for the composition given in Example 1 of *Weinl '590*, there does not exists any miscibility gap. The equilibrium composition of the cubic carbonitride and the liquid at this temperature to which the system is trying to adjust to is:

> FCC-cubic carbonitride composition at 1430 C
> Number of moles 83.92
> Composition in weight %
> TI 48.48 NB 2.06 W 17.34 TA 12.88 MO 3.53 C 8.807 N 6.77
>
> LIQUID
> Number of moles 16.08
> CO 48.58 MO 0.073 TI 0.0465 NI 24.36 C 2.54 NB 0.00955 W 17.07 TA 0.079 N 0.00145

Based on the above, it is respectfully asserted that the disclosure in *Weinl '590* does not disclose the claimed amount of hard constituents with undissolved Ti(C,N) cores. Further, one of ordinary skill in the art, considering the thermodynamics of the alloy disclosed in *Weinl '590* would have understood that the disclosed alloy in not thermodynamically favored to form the claimed amount of hard constituents with undissolved Ti(C,N) cores. For at least these further reasons, reconsideration and withdrawal of the rejection is respectfully requested.

The dependent claims rejected here and not discussed above distinguish over *Weinl '590* for at least the same reasons as discussed above for the independent claims. Accordingly, reconsideration and withdrawal of the rejection as it applies to these claims is also respectfully requested.

---

thermodynamic calculations, Proceedings of the 16th international Plansee seminar 2005, (ed. G. Kneringer et al, Reutte 2005), p.184-197.

NEW CLAIMS

New claims 7-12 have been added. These new claims also distinguish over *Weinl '590* for at least the reason that these claims include the feature of amount of undissolved Ti(C,N) cores is between 26 and 37 vol% of the hard constituents and as discussed above.

Furthermore, the new claims distinguish over the disclosure in *Weinl '590* because the claimed alloy differs from that in *Weinl '590*. Present claim 7 consists of Co Nb, W, C, N hard constituents with undissolved Ti(C,N) cores and complex carbonitride phases and Ti. However, *Weinl '590* includes Ni in his composition (see, e.g., col. 2, lines 26-27), a constituent not part of the composition of claim 7. Also, *Weinl '590* discloses the inclusion of Ta (see, e.g., col. 2, lines 16-20), a constituent not part of the composition of claim 7.

Finally, Ni is disclosed as one third of the binder phase disclosed in *Weinl '590*, but Ni dissolves Ti to a significantly greater extent than does pure Co. Thus, the inclusion of Ni in *Weinl '590* moves the alloy in *Weinl '590* further away from having the amount of claimed undissolved Ti(C,N) cores as the inclusion of Ni contributes to dissolving Ti from the 20 wt.% of Ti(C,N) included in *Weinl '590*.

CONCLUSION

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

DRINKER, BIDDLE & REATH LLP

Date: January 29, 2007

By: _____
Jeffrey G. Killian
Reg. No. 50,891

CUSTOMER NO. 055694
DRINKER, BIDDLE & REATH LLP
1500 K Street, N.W., Suite 1100
Washington, D.C. 20005-1209
Tel: (202) 842-8800
Fax: (202) 842-8465